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PROCESS CONTROLLER AND DATA MONITORING METHOD

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[There are no amendments to this patent.]

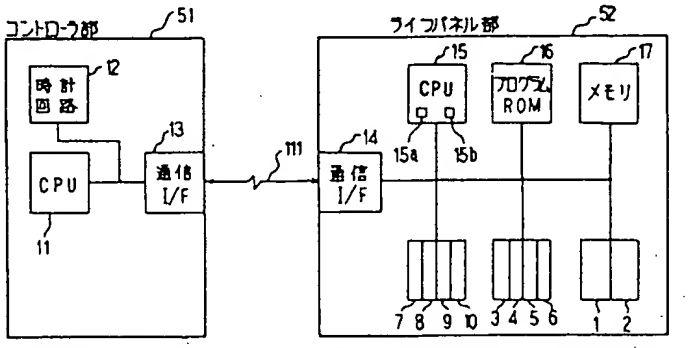
Abstract

Objective

To provide a process controller that can prevent the occurrence of problems, simplify maintenance inspection, and shorten inspection time by automatically monitoring the replacement periods of the constituent parts with a service life of the process controller.

Constitution

The use start dates and replacement periods of the constituent parts with a service life of the process controller are set by setting switch (9) and are displayed on use start date display unit (4) and replacement period display unit (6), respectively. The operating period from the use start date to the current date is calculated with calculating means (15a) and displayed on operating period display unit (5). If the operating period exceeds the replacement period, a warning signal is output from warning signal output means (15b).



1; 部品選択表示器, 2; 部品寿命警告表示器, 3; 現在日表示器, 4; 使用開始日表示器, 5; 稼働期間表示器, 6; 交換周期表示器, 7; 部品選択スイッチ, 8; 設定項目選択スイッチ, 9; 設定スイッチ, 10; 設定データ変更スイッチ, 15a; 計算手段, 15b; 警告信号出力手段, 111; 通信線

Key:
1 Part selection display unit
2 Part's service life expiration warning display unit
3 Current date replacement period
4 Use start date display unit
5 Operating period display unit
6 Replacement period display unit
7 Part selection switch
8 Set item selection switch
9 Setting switch
10 Set data changing switch
12 Clock circuit
13, 14 Communication I/F
15a Calculating means
15b Warning signal output means
16 Program ROM
17 Memory

51 Controller part
52 Life panel part
111 Communication line

Claims

1. A process controller characterized by the fact that the process controller used for controlling control objects is equipped with a means that can set the use start dates and the replacement periods of the constituent parts with a service life, a calculating means that is used calculate the operating period from the aforementioned use start date to the current date, a warning signal output means that can output a warning signal when the aforementioned operating period exceeds the replacement period, and a part's life data display means that displays the aforementioned use start date, operating period, replacement period, and other part's life data.

2. A data monitoring method with which a process controller used for controlling control objects is connected to a host man-machine monitoring device so that the part's life data generated in the aforementioned process controller can be monitored with the aforementioned man-machine monitoring device.

3. A data monitoring method with which a process controller used for controlling control objects is connected to a telephone line so that the part's life data generated in the aforementioned process controller can be monitored with a telephone or a facsimile machine.

4. A data monitoring method with which a process controller used for controlling control objects is connected to a programming tool so that the part's life data generated in the aforementioned process controller can be monitored with the aforementioned programming tool.

5. A process controller characterized by the fact that the process controller used for controlling control objects is equipped with a means that can set the use start dates and the replacement periods of the constituent parts with a service life, a calculating means that is used calculate the operating period from the aforementioned use start date to the current date, a warning signal output means that can output a warning signal when the aforementioned operating period exceeds the replacement period, a part's life data display means that displays the aforementioned use start date, operating period, replacement period, and other part's life data, and a part replacement history list file that stores the aforementioned part's life data.

Detailed explanation of the invention

[0001]

Industrial application field

The present invention pertains to a process controller and a data monitoring method that can be applied to a control instrumentation system used for controlling printing, etc.

[0002]

Prior art

Figure 10 shows a monitor panel for displaying the operating status of a conventional process controller in an instrumentation control system to the operator according to the Maintenance Inspection Summary of Mitsubishi General Instrumentation Control System MACTUS530 (IB-62527-A, published in June 1993). Figure 11 is a schematic oblique view of the process controller. In Figure 10, (25)-(29) represent LED display units for displaying the operating status of the process controller. More specifically, (25) represents a serious problem LED display unit; (26) represents a light problem LED display unit; (27) represents a CPU power supply abnormality LED display unit; (28) represents an I/O power supply abnormality LED display unit; and (29) represents a low-battery LED display unit. (30) is a logic diagram illustrating the cause of the serious problems, and (31) is a logic diagram illustrating the cause of the light problems.

[0003]

The operation will be explained below. The operator of the process controller determines whether the instrumentation control system works properly or is experiencing some problems by monitoring serious problem LED display unit (25) and light problem LED display unit (26). Each of LED display units (25)-(29) is turned on when the system works properly and is turned off when an abnormality occurs.

[0004]

When serious problem LED display unit (25) is turned off, it means that a serious problem occurs in the process controller. Subsequently, the cause of the serious problem is traced by using logic diagram (30), and the abnormal part is specified. For example, if CPU power supply abnormality LED display unit (27) and I/O power supply abnormality LED display unit (28) are turned off, it means that the abnormal parts are the CPU power supply and I/O power supply where the serious problem of the system occurs. Then, the process controller is stopped, and the broken CPU power supply and I/O power supply are replaced to recover the instrumentation control system.

[0005]

Similarly, if light problem LED display unit (26) is turned off, it means that a light problem occurs in the process controller. The cause of the light problem is traced by using logic diagram (31), and the abnormal part is specified. For example, if low-battery LED display unit (29) is turned off, it becomes necessary to replace the battery with a new one because the battery power is low.

[0006]

Problems to be solved by the invention

Since the monitor panel of the conventional process controller has the aforementioned configuration, it is possible to determine whether each part is normal or abnormal. However, it is impossible to determine whether a part has reached its service life limit and needs to be replaced by simply observing the monitor panel. The operator must prepare a part replacement table periodically and confirms the part replacement period according to this table. This is inconvenient.

[0007]

The purpose of the present invention is to solve the aforementioned problem by providing a process controller that can prevent the occurrence of problems, simplify maintenance inspection, and shorten inspection time by automatically monitoring the replacement periods of the parts of the process controller with a service life.

[0008]

Means to solve the problems

The process controller disclosed in the first part of the present invention is equipped with a setting means (setting switch (9)) that can set the use start dates and the replacement periods of the constituent parts with a service life, a calculating means (15a) that is used calculate the operating period from the aforementioned use start date to the current date, a warning signal output means (15b) that can output a warning signal when the aforementioned operating period exceeds the replacement period, and part's life data display means (use start date display unit (4), operating period display unit (5), and replacement period display unit (6)) which displays the aforementioned use start date, operating period, replacement period, and other part's life data.

[0009]

The data monitoring method disclosed in the second part of the present invention is characterized by the fact that a process controller P used for controlling control objects is connected to a host man-machine monitoring device (18) so that the part's life data generated in the aforementioned process controller P can be monitored with said man-machine monitoring device (18).

[0010]

The data monitoring method disclosed in the third part of the present invention is characterized by the fact that a process controller P used for controlling control objects is connected to a telephone line (95) so that the part's life data generated in the aforementioned process controller P can be monitored with a telephone (92) or a facsimile machine (93).

[0011]

The data monitoring method disclosed in the fourth part of the present invention is characterized by the fact that a process controller P used for controlling control objects is connected to a programming tool (20) so that the part's life data generated in the aforementioned process controller P can be monitored with said programming tool (20).

[0012]

The process controller disclosed in the fifth part of the present invention is equipped with a setting means (setting switch (9)) that can set the use start dates and the replacement periods of the constituent parts with a service life, a calculating means (15a) that is used calculate the operating period from the aforementioned use start date to the current date, a warning signal output means (15b) that can output a warning signal when the aforementioned operating period exceeds the replacement period, a part's life data display means (use start date display unit (4), operating period display unit (5), and replacement period display unit (6)) that displays the aforementioned use start date, operating period, replacement period, and other part's life data, and a part replacement history list file (23) that stores the aforementioned part's life data.

[0013]

Operation

For the process controller disclosed in the first part of the present invention, the use start dates and replacement periods of the constituent parts with a service life are set by setting means (setting switch (9)), and the operating periods from the use start dates to the current date are calculated with calculating means (15a). Also, the use start dates, replacement periods, and

operating periods are displayed on the part's life data display means (use start date display unit (4), replacement period display unit (6), and operating period display unit (5)). If the operating period exceeds the replacement period, a warning signal will be output from warning signal output means (15b).

[0014]

In the data monitoring method disclosed in the second part of the present invention, the part's life data generated by process controller P are sent to host man-machine monitoring device (18) so that they can be monitored by host man-machine monitoring device (18).

[0015]

In the data monitoring method disclosed in the third part of the present invention, the part's life data generated by process controller P are sent to telephone (92) or facsimile machine (93) through a telephone line (95). In this way, the part's life data can be monitored with telephone (92) or facsimile machine (93).

[0016]

In the data monitoring method disclosed in the fourth part of the present invention, part's life data generated by process controller P are sent to programming tool (20) so that they can be monitored by programming tool (20).

[0017]

For the process controller disclosed in the fifth part of the present invention, the use start dates and replacement periods of the constituent parts with a service life are set by setting means (setting switch (9)), and the operating periods from the use start dates to the current date are calculated with calculating means (15a). Also, the use start dates, replacement periods, and operating periods are displayed on the part's life data display means (use start date display unit (4), replacement period display unit (6), and operating period display unit (5)). If the operating period exceeds the replacement period, a warning signal will be output from warning signal output means (15b). Also, the part's life data are stored in part replacement history list file (23).

[0018]

Application examples

Application Example 1

In the following, Application Example 1 of the present invention will be explained with reference to the figures. Figure 1 is a block diagram illustrating the configuration of the process

controller disclosed in Application Example 1 of the present invention. In Figure 1, controller part (51) is equipped with CPU (11), clock circuit (12), and communication interface (communication I/F) (13). Service life panel part (52) is equipped with communication interface (14), CPU (15), program ROM (16), memory (17), part selection display unit (1), part's service life expiration warning display unit (2), current date display unit (3), use start date display unit (part's life data display means) (4), operating period display unit (part's life data display means) (5), replacement period display unit (part's life data display means) (6), part selecting switch (7), set item selecting switch (8), setting switch (setting means) (9), and set data changing switch (10). Said display units (1) and (2) are realized with LED, while said display units (3)-(6) are realized with English numeral LEDs. Controller part (51) and life panel part (52) are connected to each other via communication line (111). Setting switch (9) in said life panel part (52) is a setting means that can set the use start dates and replacement periods of the parts with a service life, such as power supply device, fan, filter, and battery (not shown in the figure) in the process controller. CPU (15) is equipped with calculating means (15a), which calculates the operating period of each part from the use start date to the current date, and warning signal output means (15b) which can output a warning signal if the aforementioned operating period exceeds the replacement period. Figure 2 is a schematic diagram illustrating the appearance of display panel (53) on said life panel part (52). As described above, display panel (53) is equipped with part selection display unit (1), part's service life expiration warning display unit (2), current display unit (3), use start date display unit (4), operating period display unit (5), replacement period display unit (6), part selecting switch (7), set item selecting switch (8), setting switch (9), and set data changing switch (10).

[0019]

CPU (15) in life panel part (52) shown in Figure 1 controls part selection display unit (1), part's service life expiration warning display unit (2), current display unit (3), use start date display unit (4), operating period display unit (5), replacement period display unit (6), part selecting switch (7), set item selecting switch (8), setting switch (9), and set data changing switch (10). Program ROM (16) stores a program used for the control of CPU (15). Memory (17) stores the use start dates, operating periods, replacement period, etc. of the parts. In order to recognize the current date, life panel part (52) communicates with CPU (11) of controller part (51) via communication interfaces (13) and (14) and communication line (111) and reads out the time of clock circuit (12) of controller part (51).

[0020]

The display contents and the operating method of display panel (53) shown in Figure 2 will be explained below. In the process controller, the parts whose service lives are to be confirmed are selected by part selecting switch (7). At present, the corresponding part selection display units (1) are turned on in accordance with the parts selected. The use start date and operating period of each part are displayed on use start date display unit (4) and operating period display unit (5). The operating period displayed on operating period display unit (5) is obtained by subtracting the use start date displayed on use start date display unit (4) from the current date displayed on current date display unit (3). Thus, it is possible to confirm how long the part has been used. Also, the replacement period of the part is displayed on replacement period display unit (6). According to the contents of operating period display unit (5) and replacement period display unit (6), it is possible to confirm how much longer the part can be used. The operating period is calculated by operating period calculating means (15a). If the operating period displayed on operating period display unit (5) exceeds the replacement period displayed on replacement period display unit (6), it means that it is time to replace the part. The part's service life expiration warning display unit (2) is turned on with a warning signal sent from warning signal output means (15b) to inform the operator that it is time to replace the part. The contents of current date display unit (3), use start date display unit (4), and replacement period display unit (6) can be changed on the life display panel. To change the display contents, the items to be changed are first selected by set item selecting switch (8). Then, the values of the data are changed with set data changing switch (10). After the changes are made, the changed contents are registered by pressing setting switch (9).

[0021]

The operation of CPU (15) of life panel part (52) will be explained below with reference to the flow chart shown in Figures 3-5. First, the flow chart of Figure 3 shows the display processing of part's service life expiration warning display unit (2). CPU (15) of life panel part (52) reads out the time of clock circuit (12) in controller part (51) through communication interface (14) to recognize the current date (step ST1). Then, the use start date is read from memory (17) (step ST2). The use start date is subtracted from the current date to calculate the operating period which is then stored in memory (17) (step ST3). The replacement period is then read from memory (17) and compared with the operating period (step ST4). If the operating period exceeds the replacement period, part's service life expiration warning display unit (2) is turned on (step ST5). The process from step ST2 to step ST5 is carried out for all of the parts (step ST6).

[0022]

Subsequently, the flow chart of Figure 4 shows the set changing process for the current date, use start date, and replacement period. First, it is confirmed whether the current has been changed (step ST7). If there is a change, time (12) of clock circuit (12) in controller part (51) is corrected (step ST8). Then, the part selected by part selecting switch (7) is recognized (step ST9). It is then confirmed whether the use start date and replacement period are changed (step ST10 and ST12). If they are changed, the contents concerned with the use start date and replacement period stored in memory (17) are changed (step ST11 and step ST13).

[0023]

Subsequently, the flow chart of Figure 5 shows the display processing of each of display units (3)-(6). Current data display unit (3) reads out and displays the time of time clock (12) in controller part (51) (step ST14). After the part selected by part selecting switch (7) is recognized (step ST15), the use start date, operating period, and replacement period are displayed on use start date display unit (4), operating period display unit (5), and replacement period display unit (6) by reading the contents of the corresponding part from memory (17) (step ST16).

[0024]

Application Example 2

In said Application Example 1, display panel (53) comprises display units (1) and (2) made up of LED, display units (3)-(6) made of English numeral LEDs, and switches (7)-(10). In Application Example 2, however, as shown in Figure 6, it is also possible to use liquid-crystal touch panel display device (61). In this way, the device can be further miniaturized, while the same effect as that of said Application Example 1 can be realized.

[0025]

Application Example 3

In said Application Examples 1 and 2, the life panel part of the process controller must be operated by an operator to confirm the service lives of the parts. However, as shown in Figure 7, the life data of each part stored in the life panel part can also be displayed on a host man-machine monitoring device (18) via a system bus (71) to confirm the status of the parts with a service life for each of process controllers P1-Pn. It is also possible to use a telephone line (74) to automatically ring a telephone (72) or to use a FAX (facsimile) machine (19) at the permanent address of the operator when the service life of a part expires. In this way, the parts of process controllers P1-Pn with a service life can be monitored remotely. It is also possible to connect process controllers P1-Pn to a programming tool (20) to display the service life data via

communication interface (75). In this way, process controllers P1-Pn can be monitored while they are being adjusted.

[0026]

Application Example 4

In said Application Examples 1, 2, and 3, only service lives are displayed. As described in Application Example 4, however, the part replacement history can be printed out with a printer, which is connected to a host man-machine monitoring device or a programming tool, and stored as a document.

[0027]

Figure 8 is a block diagram illustrating the configuration of a system including a process controller disclosed in Application Example 4 of the present invention. In Figure 8, the same reference numbers are assigned to the parts equivalent to those shown in Figure 1, respectively, and the explanation for these parts is omitted. In Figure 8, controller part (51) of process controller P is also equipped with part replacement history file (23) which stores the part's life data generated in life panel part (52), system bus interface (82) which acts as the interface with host man-machine monitoring device (18), telephone line interface (81) which acts as the interface with telephone line (95) connected to telephone (92) or facsimile machine (93), and programming tool interface (83) which acts as the interface with programming tool (20) in addition to CPU (11), clock circuit (12), and communication interface (13) which are also used in Application Example 1. Host man-machine monitoring device (18) is equipped with system bus interface (84) which acts as the interface with controller part (51), part replacement history file (24) which stores the part's life data sent from controller part (51), CRT interface (86) which acts as the interface with CRT (90), keyboard interface (87) which acts as the interface with keyboard (91), printer interface (88) which acts as the interface with printer (21), and CPU (85) which controls the aforementioned constituent elements. Host man-machine monitoring device (18) and controller part (51) are connected via system bus (94). Printer (22) is connected to programming tool (20).

[0028]

The operation will be explained below. The part replacement contents generated in life panel part (52) are stored as a part replacement history list, such as the one shown in Figure 9, in part replacement history file (23) in controller part (51) through communication interface (14), communication line (111), and communication interface (13). The part's life data are also stored as a part replacement history list in part replacement history file (24) of host man-machine

monitoring device (18) through system bus interface (82), system bus (94), and system bus interface (84). When the part's life data stored in part replacement history file (23) of controller part (51) are sent to programming tool (20), the part replacement history list can be printed by printer (22) and output. Also, when the part's life data are sent to telephone (92), an alarm can be generated. When the part's life data are sent to facsimile machine (93), the replacement history list can be printed and output. When the part's life data stored in part replacement history file (24) of host man-machine monitoring device (18) are sent to printer (21), the part replacement history list can be printed and output. Since the content of part replacement history file (24) is displayed on CRT (90), the content can be amended by operating keyboard (91). Since the part replacement history list used in Application Example 4 can be generated automatically, the maintenance inspection performed by the operator can be simplified, and the time can be shortened.

[0029]

Effects of the invention

As explained above, the process controller disclosed in the first part of the present invention is equipped with a setting means which can set the use start dates and replacement periods of the constituent parts with a service life, a calculating means that can calculate the operating period from the use start date to the current date, a warning signal output means that can output a warning signal when the aforementioned operating period exceeds the replacement period, and a part's life data display means which can display the aforementioned use start dates, operating periods, replacement period, and other part's life data. Consequently, the times for replacing the parts of the process controller with a service life can be detected automatically and confirmed easily. In this way, the problems can be prevented before they occur. Also, the maintenance inspection operation can be simplified, and the inspection time can be shortened.

[0030]

According to the second part of the present invention, a process controller used for controlling control objects is connected to a host man-machine monitoring device so that the part's life data generated in the aforementioned process controller can be monitored by the aforementioned man-machine monitoring device. Consequently, the times for replacing the parts of the process controller with a service life can be monitored from a central monitoring room. In this way, problems can be prevented before they occur. Also, the maintenance inspection operation can be simplified, and the inspection time can be shortened.

[0031]

According to the third part of the present invention, a process controller used for controlling control objects is connected to a telephone line so that the part's life data generated in the aforementioned process controller can be monitored via telephone or a facsimile machine. Consequently, the times for replacing the parts of the process controller with a service life can be monitored remotely. In this way, problems can be prevented before they occur. Also, maintenance inspection can be simplified, and the inspection time shortened.

[0032]

According to the fourth part of the present invention, a process controller used for controlling control objects is connected to a programming tool so that the part's life data generated in the aforementioned process controller can be monitored with the aforementioned programming tool. Consequently, the times for replacing the parts with a service life can be monitored while the process controller is being adjusted. In this way, problems can be prevented before they occur. Also, the maintenance inspection operation can be simplified and the inspection time shortened.

[0033]

The process controller disclosed in the fifth part of the present invention is also equipped with a part replacement history list file which stores the part's life data in addition to the setting means, calculating means, warning signal output means, and the part's life data display means of the process controller disclosed in the first part of the present invention. Consequently, the same effects as those of the first part of the present invention can be realized, and the part replacement history list can be output. In this way, the maintenance inspection operation can be further simplified and carried out in a shorter period of time.

Brief description of the figures

Figure 1 is a block diagram illustrating the configuration of the process controller disclosed in Application Example 1 of the present invention.

Figure 2 is a diagram illustrating the display panel used in Application Example 1.

Figure 3 is a flow chart illustrating the service life expiration warning output processing in Application Example 1.

Figure 4 is a flow chart illustrating the set changing processing in Application Example 1.

Figure 5 is a flow chart illustrating the panel display processing in Application Example 1.

Figure 6 is a diagram illustrating the appearance of the liquid-crystal touch panel display device disclosed in Application Example 2 of the present invention.

Figure 7 is a diagram illustrating a system including the process controller disclosed in Application Example 3 of the present invention.

Figure 8 is a block diagram illustrating the configuration of a system including the process controller disclosed in Application Example 4 of the present invention.

Figure 9 is a diagram illustrating the part replacement history list in Application Example 4.

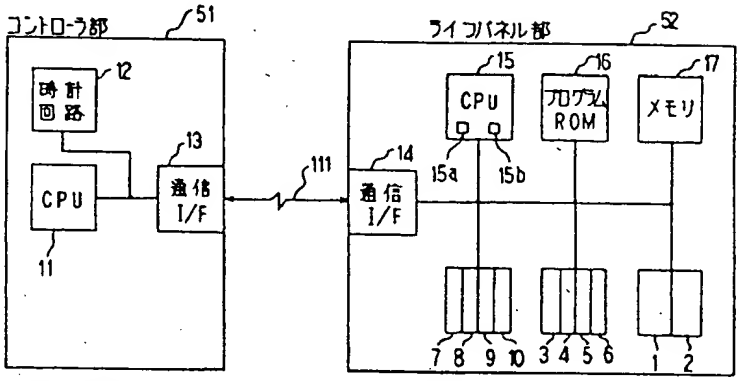
Figure 10 is a diagram illustrating the monitor panel of a conventional process controller.

Figure 11 is a schematic oblique diagram illustrating a conventional process controller.

Explanation of symbols

1	Part selection display unit
2	Part's service life expiration warning display unit
3	Current date display unit
4	Use start date display unit (part's life data display means)
5	Operating period display unit (part's life data display means)
6	Replacement period display unit (part's life data display means)
7	Part selecting switch
8	Set item selecting switch
9	Setting switch (setting means)
10	Set data changing switch
11, 15, 85	CPUs
12	Clock circuit
13, 14, 75	Communication interfaces
16	Program ROM
17	Memory
18	Host man-machine monitoring device
20	Programming tool
21, 22	Printers
23, 24	Part replacement history files
25	Serious problem LED display unit
26	Light problem LED display unit
27	CPU power supply LED display unit
28	I/O power supply LED display unit
29	Low-battery LED display unit

30	Serious problem logic diagram
31	Light problem logic diagram
51	Controller part
52	Life panel part
53	Display panel
61	Liquid-crystal touch panel display device
P, P1, Pn	Process controllers
71, 94	System buses
72, 92	Telephones
73, 93	Facsimile machines
74	Telephone line
81	Telephone line interface
82, 84	System bus interfaces
83	Programming tool interface
86	CRT interface
87	Keyboard interface
88	Printer interface
90	CRT
91	Keyboard
111	Communication line



1; 部品選択表示器、2; 部品寿命警告表示器、3; 現在日表示器、4; 使用開始日表示器、5; 稼働期間表示器、6; 交換周期表示器、7; 部品選択スイッチ、8; 設定項目選択スイッチ、9; 設定スイッチ、10; 設定データ変更スイッチ、15a; 計算手段、15b; 警告信号出力手段、111; 通信線

Figure 1

Key:
1 Part selection display unit
2 Part's service life expiration warning display unit
3 Current date replacement period
4 Use start date display unit

5 Operating period display unit
6 Replacement period display unit
7 Part selection switch
8 Set item selection switch
9 Setting switch
10 Set data changing switch
12 Clock circuit
13, 14 Communication I/Fs
15a Calculating means
15b Warning signal output means
16 Program ROM
17 Memory
111 Communication line
51 Controller part
52 Life panel part

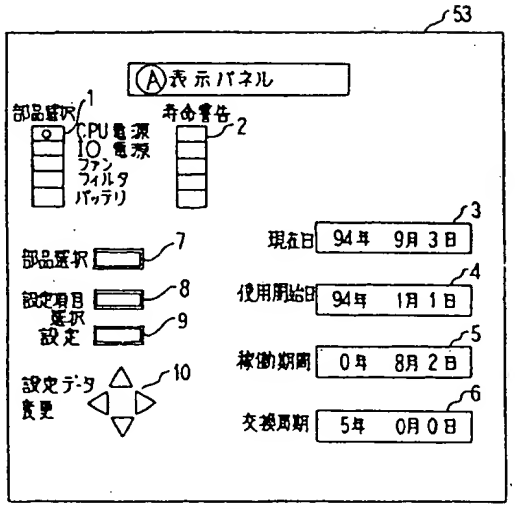


Figure 2

Key: A Display panel
1 Part selection
CPU power supply
I/O power supply
Fan
Filter
Battery
2 Service life expiration warning
3 Current date: September 3, 1994
4 Use start date: January 1, 1994
5 Operating period: 8 months and 2 days
6 Replacement period: 5 years
7 Part selection
8 Set item
9 Setting

10 Set data change

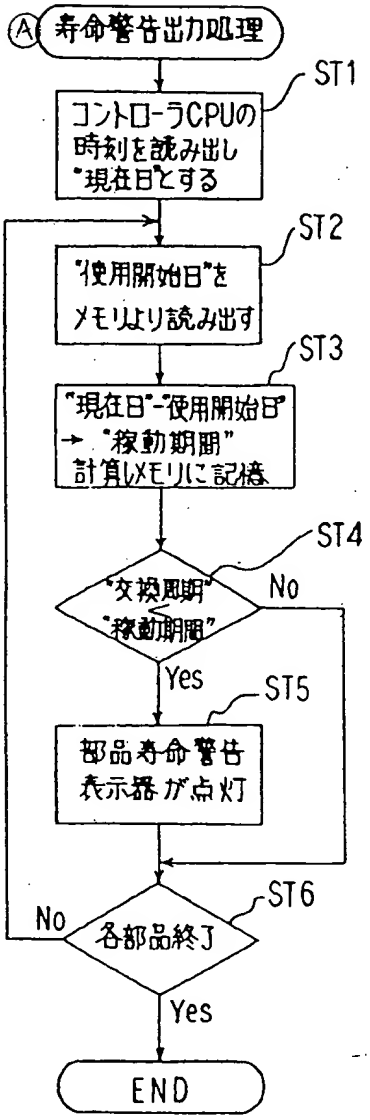


Figure 3

Key: A Service life expiration warning output processing
ST1 The time of the controller CPU is read out and taken as the "current date."
ST2 The "use start date" is read out from the memory.
ST3 "Current date" - "use start date" -> "operating period" is calculated and stored in the memory.
ST4 "Replacement period" < "operating period"
ST5 The part's service life expiration warning display unit is turned on.
ST6 Completed for all the parts?

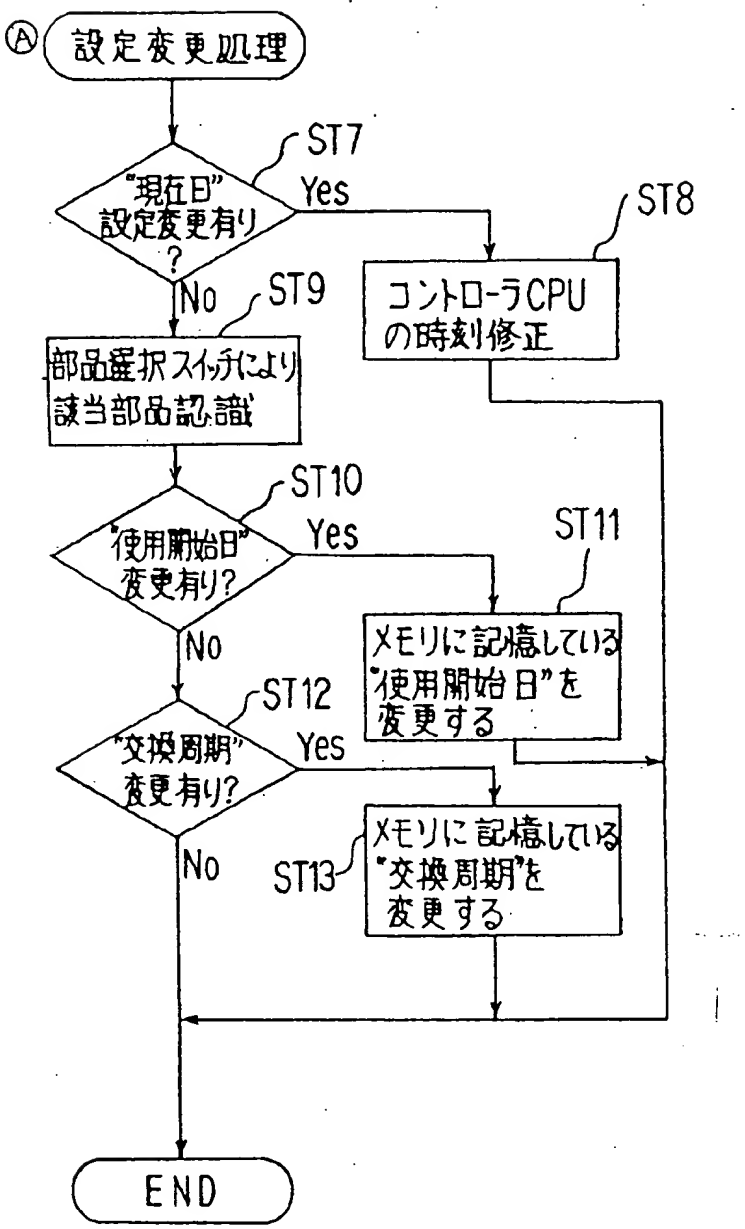


Figure 4

Key:
- A Set changing processing
- ST7 Is the "current date" changed?
- ST8 Correct the time of the controller CPU
- ST9 The corresponding part is recognized by the part selecting switch.
- ST10 Is the "use start date" changed?
- ST11 The "use start date" stored in the memory is changed.
- ST12 Is the "replacement period" changed?
- ST13 The "replacement period" stored in the memory is changed.

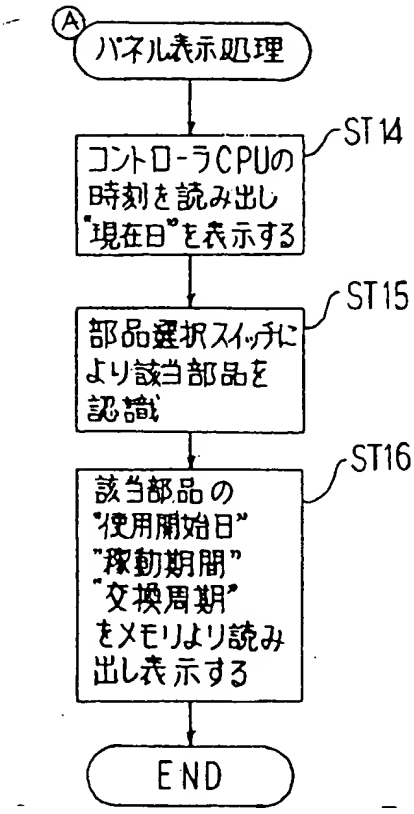


Figure 5

Key: A Panel display processing
ST14 The time of the controller CPU is read out, and the "current date" is displayed.
ST15 The corresponding part is recognized by the part selecting switch.
ST16 The "use start date," "operating period," and "replacement period" of the corresponding part are read out from the memory and displayed.

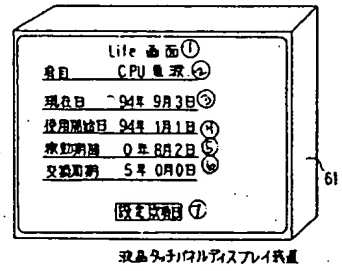
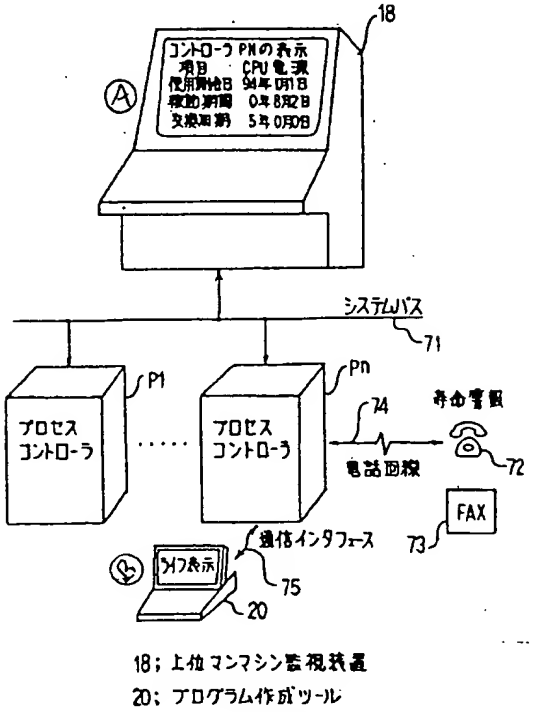


Figure 6

Key: 1 Life picture
2 Item: CPU power supply
3 Current date: September 3, 1994
4 Use start date: January 1, 1994
5 Operating period: 8 months and 2 days
6 Replacement period: 5 years

7 Set Next item
61 Liquid-crystal touch panel display device



18; 上位マンマシン監視装置
20; プログラム作成ツール

Figure 7

Key: A Display of controller PN
Item: CPU power supply
Use start date: January 1, 1994
Operating period: 8 months and 2 days
Replacement period: 5 years
B Life display
P1 Process controller
Pn Process controller
18 Host man-machine monitoring device
20 Programming tool
71 System bus
72 Service life warning
74 Telephone line
75 Communication interface

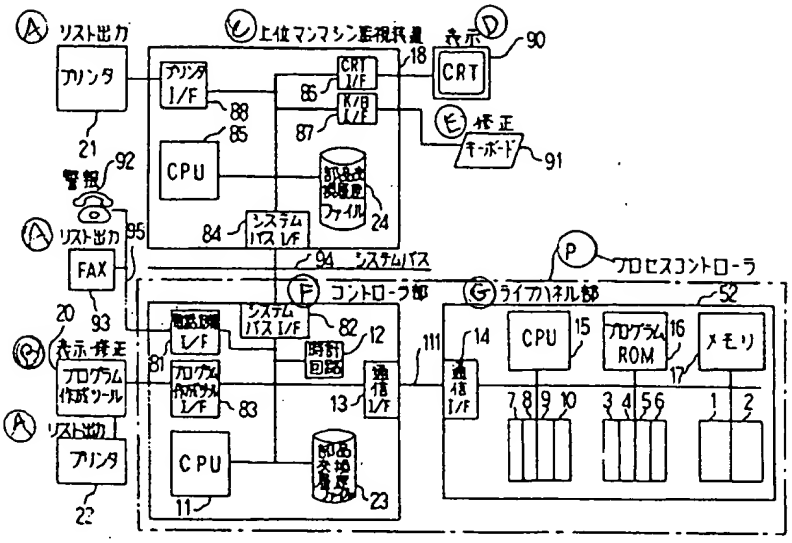


Figure 8

Key:

A	List output
B	Display/amendment
C	Host man-machine monitoring device
D	Display
E	Amendment
F	Controller part
G	Life panel part
P	Process controller
12	Clock circuit
13	Communication I/F
14	Communication I/F
16	Program ROM
17	Memory
20	Programming tool
21	Printer
22	Printer
23	Part replacement history file
24	Part replacement history file
81	Telephone line I/F
82	System bus I/F
83	Programming tool I/F
88	Printer I/F
84	System bus I/F
91	Keyboard
92	Alarm
94	System bus

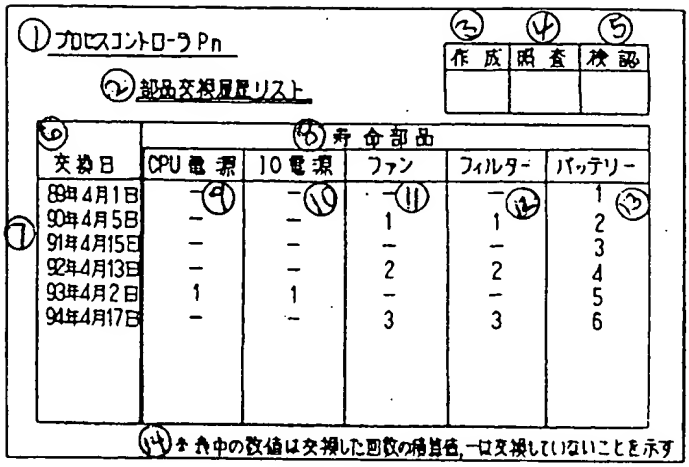


Figure 9

Key:
1 Process controller Pn
2 Part replacement history list
3 Preparation
4 Verification
5 Confirmation
6 Replacement date
7 April 1, 1989
April 5, 1990
April 15, 1991
April 13, 1992
April 2, 1993
April 17, 1994
8 Parts with a service life
9 CPU power supply
10 I/O power supply
11 Fan
12 Filter
13 Battery
14 The values in the table are the accumulated times of replacement, and—means no replacement is made.

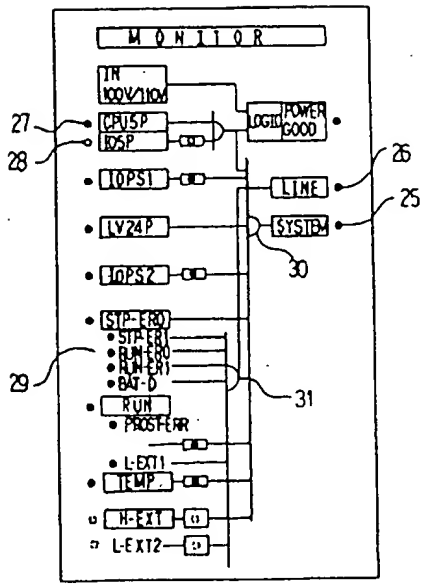


Figure 10

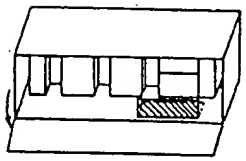


Figure 11